

A cabin structure for a working machine

The invention relates to a cabin structure for a working machine as set forth in the preamble of claim 1. The invention also relates to a cabin structure for a working machine as set forth in the preamble of claim 13.

According to prior art (e.g. SE patent publication 509528), the control mechanism is normally placed between the cabin structure and the frame of the working machine. Although these solutions have been functional as such, they have, at least in some applications, resulted in impractical constructions, because the requirement for space taken by the control mechanism increases the main dimensions of the working machine, *i.e.* its width, length and height. Other control mechanisms are presented in DE application publication 3405921, whose inclination is uncomfortable for the operator because of swinging. In the above-mentioned control mechanism, as well as in EP application publication 636512, the moving means are placed in such a way that levelling of the mechanism will cause tilting of the seat, which, in turn, must be corrected again by levelling.

It is an aim of this invention to present a novel cabin structure, whereby it is possible to provide, to a great extent, the movements of the cabin structure according to prior art, while also providing new possibilities for moving the cabin structure. Furthermore, the cabin structure according to the invention makes it possible that the main dimensions of the working machine are not increased, if so desired, but they can be kept reasonable, even though the control mechanism is more versatile. From the point of view of the operator of the working machine, the cabin structure meets the demands set for modern working facilities.

The cabin structure according to the invention is presented in the appended claim 1. The cabin structure according to the invention is also presented in the appended claim 13.

With the solution presented above, as the cabin element is stationary in relation to the frame of the working machine, a compact unit is

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provided, in which the control mechanism can be placed in a small space and it can also include third means for rotating the working base around the Z axis.

- 5 According to a particularly advantageous embodiment, the first and second means of the control mechanism for tilting of the working base are placed underneath the third means of the control mechanism. This solution has the advantage that the rotating of the working base around the Z axis can be implemented in a continuous manner after the levelling step performed by the first and second means in each working position of the working machine.

- 10 Furthermore, it is advantageous that the movements of the first and second means of the control mechanism for tilting of the working base are fitted to take place around a substantially joint centre of motion, preferably in such a way that the substantially joint centre of motion is on the Z axis. In this way, the ease at work of the person using the working means on the working base is optimised, particularly when the centre of motion of the control mechanism is placed above the seat part 15 of the seat intended for the operator of the working machine, to be preferably placed substantially at the level of the operator's hip.

- 20 The other dependent claims present some preferred embodiments of the cabin structure according to the invention.

- 25 The invention will be described in the description hereinbelow, in which reference is made to the embodiment shown in the appended drawings. In the drawings,

- 30 Fig. 1 shows schematically, in a slanted perspective view from above, a working machine, in connection with which an application of the cabin structure according to the invention is placed,

- 35 Fig. 2 shows, also in a slanted perspective view from above, an application of the cabin structure according to Fig. 1,

- Fig. 3 shows, further in a slanted perspective view from above, tools and a control mechanism, which are used in connection with the application of the cabin structure according to Fig. 2,
- Fig. 4 shows the cabin structure according to Fig. 2 in a vertical cross-section, and
- Fig. 5 shows, in a slanted perspective view from above, the seat and control mechanism for the cabin structure according to Fig. 2.
- Particularly with reference to Fig. 1, the cabin structure 1 is placed in connection with the working machine 2. In the presented application, the working machine is a forest working machine with frame steering, Fig. 1 showing only its most important parts. The cabin structure 1 (cf. particularly Figs. 2 to 4) comprises a substantially transparent cabin element 4 equipped with a bottom part 3, as well as working means 5, 6 placed inside the cabin element 4, i.e. a seat 5 for the operator K of the working machine 2, and display and control means 6 for controlling the operations of the working machine 2. The cabin structure 1 also comprises a control mechanism 7 with means 7a, 7b and 7c coupled to each other, i.e. the first 7a and second 7b means for tilting the working means 5, 6 in relation to the body of the working machine 2 as well as in the planes XZ and YZ, and the third 7c means for rotating the working base around the Z axis. The orthogonal XYZ coordinate system is shown in Fig. 2, wherein the X direction is the horizontal longitudinal direction of the working machine, the Y direction is the horizontal transverse direction of the working machine (that is, the X and Y directions are perpendicular to each other), and the Z direction is the vertical direction.
- According to a basic idea of the invention, the cabin element 4 is arranged to be substantially stationary in relation to the frame of the working machine 2. The outer surface of the bottom part 3 of the cabin

element 4 is provided with connecting means 8, particularly lugs shown in Fig. 2, to connect the cabin structure 1 to the frame of the working machine 2. The bottom part 3 of the cabin element 4 is arranged to have a downwards reducing horizontal cross-section.

Furthermore, the working means 5, 6 are placed on a working base 9 placed on the bottom part 3 of the cabin element 4. In the presented embodiment, the shape of the working base 9 is a substantially circular plane surface, which also substantially constitutes the functional floor surface of the cabin structure 1. To the outer edge of the working base 9 is fixed an annular collar part 10a whose outer surface has an at least spherical shape and which extends downwards from the outer edge, towards the centre of the working base 9. Particularly for reasons of space saving, the working base 9 is elevated from its basic level underneath the seat part 5a of the seat 5 (see truncated conical part 9a in Fig. 4), wherein the space formed inside the elevated part 9a, underneath the seat part 5a of the seat 5, accommodates parts of the control mechanism 7, at least the third means 7c for rotating the working base around the Z axis.

As shown particularly in Fig. 4, the control mechanism 7 is placed between the working base 9 (in reality, in horizontal position VA) and the bottom part 3 of the cabin element 4 (in reality, tilted according to the frame position KA) so that the first 7a and second 7b means of the control mechanism 7 for tilting the working base are placed, in the height direction, underneath the third 7c means of the control mechanism 7. Furthermore, the movements of the first 7a and second 7b means of the control mechanism 7 for tilting the working base 9 are arranged to be effected around a substantially joint movement centre LKP, wherein this movement centre LKP is preferably on the Z axis and placed above the seat part 5a of the seat 5 intended for the operator K of the working machine 2, preferably to be placed substantially at the level of the operator's K hip, as shown in Fig. 5. The detailed structure of the control mechanism 7 itself will not be described in this context, because e.g. the applicant's previous FI patent application 991449 discloses a position adjustment mechanism which can,

when modified, also be applied in the applications of the present invention.

- 5 The working base 9 and the bottom part 3 of the cabin element 4 of the cabin structure 1 are thus connected by the control mechanism 7 so that the lower one 7a of the first and second means 7a, 7b implementing the tilting of the working base 9 in relation to the frame of the working machine 2 is connected to the bottom part 3, for example, by means of a flange support, and the third 7c means for rotating the working base 9 are connected to the working base 9, its lower surface, for example to the central elevated part 9a in connection with the working base 9.
- 10 A cover arrangement 10a, 10b is placed in the point of linkage between the bottom part 3 and the working base 9 to connect the working base 9, separate from the control mechanism 7, to the cabin element 4 during their respective movements. The cover arrangement 10a, 10b preferably consists of two parts in such a way that its first part 10a, *i.e.* the annular collar part which is connected to the outer edge of the working base 9, at least its outer surface having a spherical shape, extends downwards, and the second part 10b consists of that part of the inner surface 3a of the bottom part 3 which is exposed during the movements of the working base 9, as shown in Fig. 4. To provide the system of movements presented above, it is advantageous that the shape of the bottom part 3 of the cabin element 4, at least of the inner surface 3a, at least on that range of height dimension in which the working base 9 moves during the respective movements of the working base 9 and the frame of the working machine 2, is a spherical surface, preferably so that the whole bottom part 3 of the cabin element 4, at least on the side of the inner surface, is substantially spherical. In the embodiment presented in the drawings, the bottom part 3 is, substantially as a whole, a sheet-like form piece with a spherical shape, whose upper edge 3b is connected to a substantially horizontal collar part 11 formed at the lower edge 4a of the cabin element 4. Thus, in the presented embodiment, the horizontal cross-section of the bottom part 3 of the cabin element 4 reduces downwards, which makes it possible to
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save space, particularly in the height direction of the working machine. Furthermore, the centre KK of the spherical form of the inner surface 3a of the bottom part 3 (Fig. 4) is placed above the seat part 5a of the seat 5, by the hip of the operator K. Preferably, the centre KK joins the movement centre LKP (see also Fig. 5). The diameter of the circular working base 9 is selected so that it is substantially placed in the upper part of the spherical shape of the bottom part 3, touching the spherical shape at the whole length of its circumference, wherein the annular collar part 10, whose outer surface has an at least spherical shape and which forms the first part of the cover arrangement 10a, 10b, is placed on the inner surface 8a of the bottom part 3.

Claims:

1. A cabin structure (1) for a working machine, comprising:
 - 5 – a cabin element (4) which is equipped with a bottom part (3) and which is substantially stationary in relation to the working machine (2),
 - 10 – working means (5, 6) placed inside the cabin element (4), comprising a seat (5) for the operator (K) of the working machine as well as display and control means (6) for controlling the operations of the working machine,
 - 15 – a movable working base (9), on which the working means (5, 6) are placed, and
 - 20 – a control mechanism (7) for levelling the working position of the operator (K), comprising first and second means (7a, 7b) for tilting the working base (9) in the longitudinal direction (XZ) and the transverse direction (YZ) of the working machine (2), and third means (7c) for rotating the working base around a vertical axis (Z) of rotation,
characterized in that
 - 25 – the movements of the first and second means (7a, 7b) are arranged to take place around a joint movement centre (LKP) in such a way that the movement centre (LKP) is placed on a vertical axis (Z) of rotation and also above the working base (9), and
 - 30 – the working base (9) is placed above the bottom part (3), and the control mechanism (7), in turn, is placed between the working base (9) and the bottom part (3) in such a way that the first and second means (7a, 7b) are placed underneath the third means (7c).
- 35 2. A cabin structure according to claim 1, **characterized** in that the working base (9) is circular and is arranged touchingly at the inner

- surface (3a) of the bottom part (3), whose shape is a spherical surface at least on that range of height dimension in which the outer edge of the working base (9) moves during respective movements of the working base (9) and the frame of the working machine (2), wherein the centre (KK) of the spherical shape is placed in said movement centre (LKP).
3. A cabin structure according to claim 2, **characterized** in that the diameter of the working base (9) is selected so that the working base (9) is placed substantially at the upper edge (3b) of the spherical shape formed by the inner surface (3a), touching the spherical shape at the whole length of its circumference.
- 10 4. A cabin structure according to claim 2 or 3, **characterized** in that the outer edge of the working base (9) is provided with a downwards extending annular collar part (10a) which has at least an outer surface which is spherical and which is placed on the bottom part (3).
- 15 5. A cabin structure according to any of the claims 1 to 4, **characterized** in that the movement centre (LKP) is placed above the seat part (5a) of the seat (5), preferably substantially at the level of the hip of the operator (K).
- 20 6. A cabin structure according to any of the claims 1 to 5, **characterized** in that the lower one of the first and second means (7a, 7b) is connected to the bottom part (3), and the third means (7c) are connected to the working base (9).
- 25 7. A cabin structure according to any of the claims 1 to 6, **characterized** in that the working base (9) comprises an elevated part (9a) underneath the seat part (5a) of the seat (5), wherein at least the third means (7c) are placed in the space formed in connection with the elevated part (5a).
- 30 8. A cabin structure according to any of the claims 1 to 7, **characterized** in that a cover arrangement (10a, 10b), separate from the control mechanism (7), is placed at the point of linkage between the bottom

- part (3) and the working base (9) to connect the working base (9) to the cabin element (4) during their respective movements, and that the first part (10a) of the cover arrangement (10a, 10b) is placed at the edge of the working base (9), to extend downwards, and the second (10b) part 5 consists of the inner edge (3a) of the bottom part (3).
9. A cabin structure according to claim 8, characterized in that the first part (10a) of the cover arrangement (10a, 10b) consists of the collar part of the working base (9), which has at least an outer surface with 10 a spherical shape and which is placed on the bottom part (3).
10. A cabin structure according to any of the claims 1 to 9, characterized in that the bottom part (3) is a sheet-like form piece which is connected at its upper edge to a substantially horizontal collar part (4a) 15 formed at the lower edge of the cabin element (4).
11. A cabin structure according to any of the claims 1 to 10, characterized in that the bottom part (3) is designed to have a downwards reducing horizontal cross-section, for example in such a way that the 20 whole bottom part (3) is, at least on the side of the inner surface (3a), substantially spherical.
12. A cabin structure according to any of the claims 1 to 11, characterized in that the outer surface of the bottom part (3) of the cabin element (4) comprises connecting means (8) for connecting the cabin structure (1) to the frame of the working machine (2). 25
13. A cabin structure (1) for a working machine, comprising:
- 30 – a cabin element (4) which is equipped with a bottom part (3) and which is substantially stationary in relation to the working machine (2),
– working means (5, 6) placed inside the cabin element (4), comprising a seat (5) for the operator (K) of the working machine as well as display and control means (6) for controlling the operations of the working machine,
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- a movable working base (9), on which the working means (5, 6) are placed, and
- a control mechanism (7) for levelling the working position of the operator (K), comprising first and second means (7a, 7b) for tilting the working base (9) in the longitudinal direction (XZ) and the transverse direction (YZ) of the working machine (2), and third means (7c) for rotating the working base around a vertical axis (Z) of rotation,

5 10 **characterized** in that

- the movements of the first and second means (7a, 7b) are arranged to take place around a joint movement centre (LKP) in such a way that the movement centre (LKP) is placed on a vertical axis (Z) of rotation and also above the working base (9),
- the working base (9) is placed above the bottom part (3), and the control mechanism (7), in turn, is placed between the working base (9) and the bottom part (3), and
- the working base (9) is circular and is arranged touchingly at the inner surface (3a) of the bottom part (3), whose shape is a spherical surface at least on that range of height dimension in which the outer edge of the working base (9) moves during levelling movements of the working base (9), wherein the centre (KK) of the spherical shape is placed in said movement centre (LKP).

15 20 25 30 35 14. A cabin structure according to claim 13, **characterized** in that the diameter of the working base (9) is selected so that the working base (9) is placed substantially at the upper edge (3b) of the spherical shape formed by the inner surface (3a), touching the spherical shape at the whole length of its circumference.

15 20 25 30 35 15. A cabin structure according to claim 13 or 14, **characterized** in that the outer edge of the working base (9) is provided with a downwards extending annular collar part (10a) which has at least an outer

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surface which is spherical and which is placed on top of the bottom part (3).